

1/3

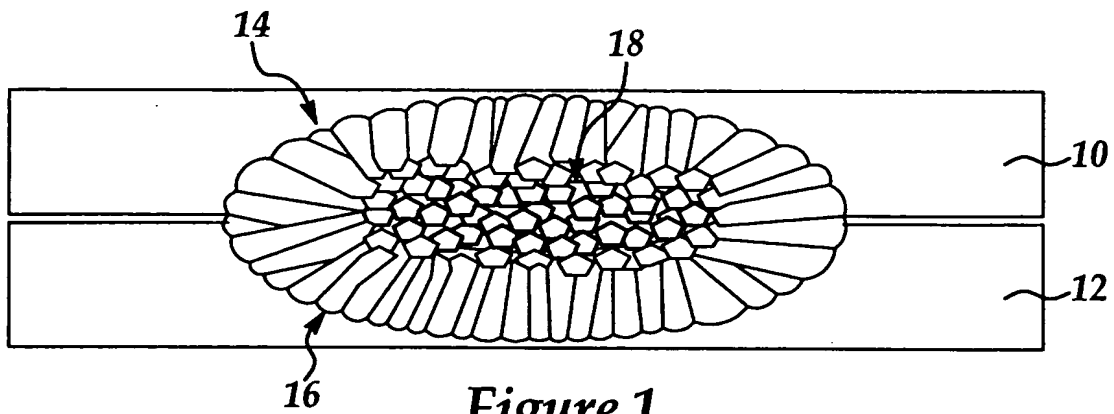


Figure 1
Prior Art

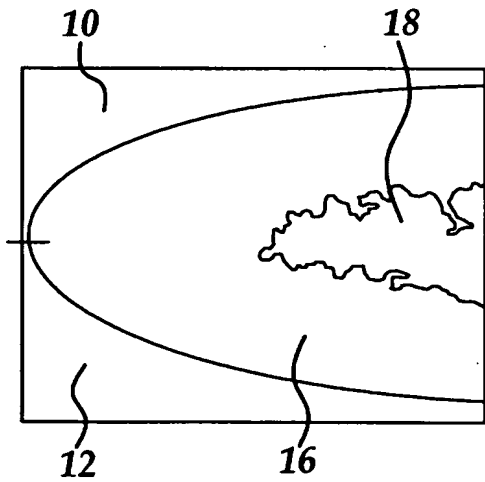


Figure 2
Prior Art

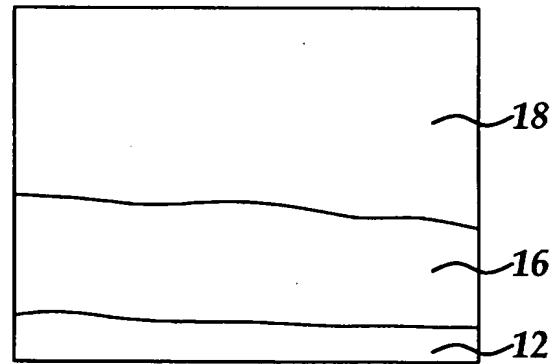


Figure 3
Prior Art

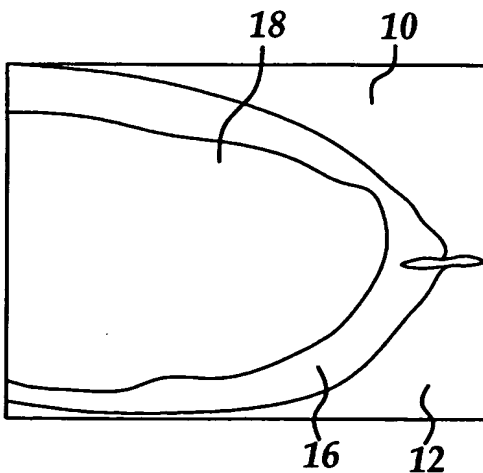


Figure 4

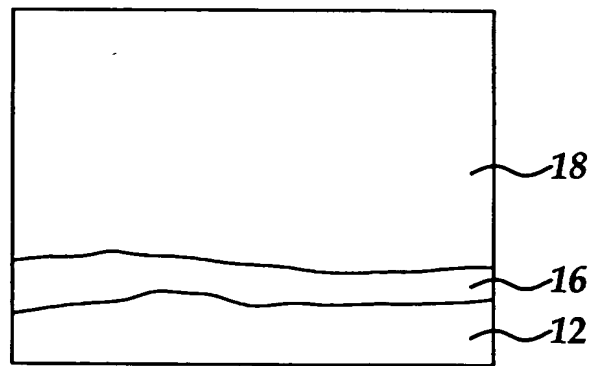


Figure 5

2/3

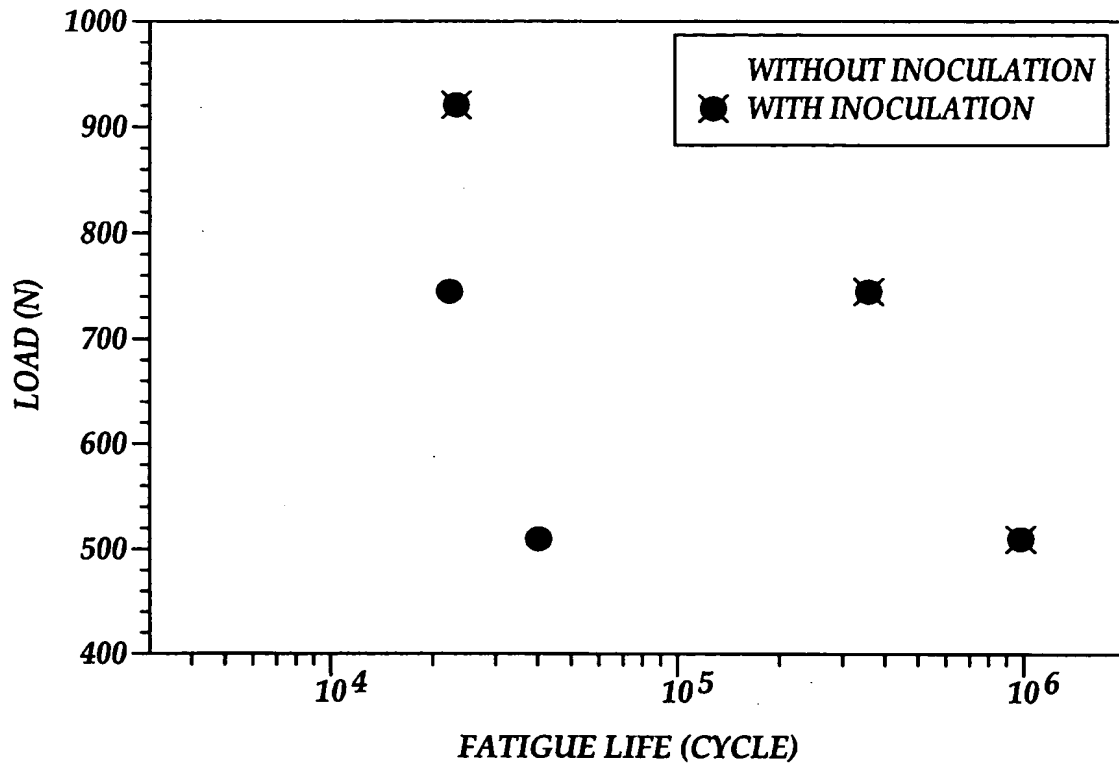


Figure 6

| The sorts of inoculation | The specimens No. | Welding parameters | | | | | | Mechanical properties | | | | | |
|--------------------------|-------------------|-----------------------|------|-------|-------------------|---------------------------------|---------------------------------|--------------------------------------|------------------------------|--------------------------------|--------------|-----------------|---------------|
| | | Welding current Iw/kA | | | Welding time tw/s | Welding force F ₁ /N | Forging force F ₂ /N | Tensile shear load F ₇ /N | Tensile shear load range (N) | Average tensile shear load (N) | The bias (%) | Improvement (%) | Fracture type |
| NO | 501 | 18.7 | 18.7 | 18.74 | 0.14 | 3000 | 7000 | 2822 | 2822 | 2877.8 | -1.94 | / | tore |
| | 502 | 18.7 | ~ | 2906 | | | | ~ | 2920 | ~ | | | |
| | 503 | 18.7 | 18.8 | 2920 | | | | +1.47 | | | | | |
| | 504 | 18.8 | 2910 | | | | | | | | | | |
| | 505 | 18.8 | 2831 | | | | | | | | | | |
| | | | | | | | | | | | | | |
| Al-Ti5B1RE1 | 511 | 20.3 | 20.3 | 20.34 | 0.18 | 3000 | 7000 | 3250 | 3250 | 3451.8 | -5.85 | 19.95 | |
| | 512 | 20.3 | ~ | | | | | 3597 | ~ | ~ | | | |
| | 513 | 20.4 | 20.4 | | | | | 3508 | 3597 | +6.56 | | | |
| | 514 | 20.4 | 3452 | | | | | | | | | | |
| Al-Ti3C 0.15 | 521 | 20.3 | 20.3 | 20.5 | 0.18 | 3000 | 7000 | 3015 | 2985 | 3254.5 | -7.36 | 13.09 | |
| | 522 | 20.5 | ~ | | | | | 3471 | ~ | | ~ | | |
| | 523 | 20.5 | 20.7 | | | | | 3547 | 3547 | | +8.99 | | |
| | 524 | 20.7 | | | | | | 2985 | | | | | |

Figure 7

3/3

| Dead load <input type="checkbox"/> N <input type="checkbox"/> | Max dynamic load (N) | Cicles without inoculations | Cicles with inoculations | Improvement (%) |
|---|----------------------|-----------------------------|--------------------------------|-----------------|
| 1370 | 920 | 2.25×10^3 | 2.9×10^3 | 28.9 |
| 1370 | 745 | 6.5×10^3 | 1.7×10^4 | 161.5 |
| 1370 | 510 | 3.19×10^4 | 8.7×10^4 | 172.7 |
| 1370 | 385 | 1.29×10^5 | 0.99×10^6 , not break | — |

Figure 8

| The sorts of inoculation | The specimens No. | Welding parameters | | | | | | Mechanical properties | | | | | | | |
|--------------------------|-------------------|-----------------------|------|-------|-------------------|---------------------------------|---------------------------------|--------------------------------------|------------------------------|--------------------------------|--------------|-----------------|---------------|-------|--------|
| | | Welding current Iw/kA | | | Welding time tw/s | Welding force F ₁ /N | Forging force F ₂ /N | Tensile shear load F _T /N | Tensile shear load range (N) | Average tensile shear load (N) | The bias (%) | Improvement (%) | Fracture type | | |
| NO | 601 | 20.9 | 20.9 | 20.94 | 0.22 | 2100 | 5600 | 2255 | 1471 | 1840.2 | -20.06 | ~ | ripped | | |
| | 602 | 20.9 | | | | | | 1471 | | | | | | | |
| | 603 | 20.9 | | | | | | 1635 | | | | | | | |
| | 604 | 21.0 | | | | | | 2169 | | | | | | | |
| | 605 | 21.0 | | | | | | 1671 | | | | | | | |
| AITi5B1RE1 | 611 | 23.0 | 23.0 | 23.05 | 0.22 | 2100 | 5600 | 2673 | 2335 | 2496 | -6.45 | 35.64 | tore | | |
| | 612 | 23.1 | ~ | | | | | 2335 | ~ | 2730 | ~ | 49.98 | | | |
| | 613 | 23.1 | 23.1 | | | | | 2344 | 2673 | | +7.09 | | | | |
| | 614 | 23.1 | 23.5 | | | | | 2632 | 2813 | | +3.0 | | | | |
| AITi3C 0.15 | 621 | 23.1 | 23.1 | 23.25 | 0.22 | 2100 | 5600 | 2627 | 2655 | 2730 | -2.75 | 49.98 | | | |
| | 622 | 23.2 | ~ | | | | | 2813 | ~ | | 2813 | | | +3.0 | |
| | 623 | 23.2 | 23.5 | | | | | 2665 | | | | | | | |
| | 624 | 23.5 | 23.1 | | | | | 2776 | 2464 | | | | | | -13.75 |
| AlSr10 | 631 | 23.1 | 23.1 | 23.1 | 0.22 | 2100 | 5600 | 3008 | 2464 | 2856.8 | -13.75 | 55.24 | | | |
| | 632 | 23.1 | | | | | | 2464 | ~ | | 3008 | | | +5.29 | |
| | 633 | 23.1 | | | | | | 2972 | | | | | | | |
| | 634 | 23.1 | | | | | | 2983 | | | | | | | |

Figure 9

| Dead load <input type="checkbox"/> N <input type="checkbox"/> | Max dynamic load (N) | Cicles without inoculations | Cicles with inoculations | Improvement (%) |
|---|----------------------|-------------------------------|-------------------------------|-----------------|
| 1370 | 920 | Break immediately after start | 1.75×10^3 | — |
| 1370 | 745 | 1.35×10^3 | 3.9×10^4 | 2788.9 |
| 1370 | 510 | 1.215×10^4 | 1.725×10^5 | 1319.8 |
| 1370 | 385 | 2.67×10^5 | 3.6×10^5 | 34.8 |
| 1370 | 270 | 4.05×10^5 | 0.9×10^6 , not break | — |

Figure 10